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FRACTURED RIBS IN THE INSANE.

BY

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Nothing gives so bad an impression of the management of an asylum as the occurrence in patients of fractured ribs. The press calls special attention to it, and the public mind is much exercised on the matter, whilst it passes unnoticed many things of at least equal importance. Considering the way in which excited and restless persons have to be herded together, the wonder is that such casualties are not more frequent. It is no doubt a defect in our asylum system that so many troublesome and violent cases have to be placed together; but the expense of these buildings is so enormous, the accommodation is already so insufficient, and the numbers to be treated are so vast, that whilst doing what is possible with the present arrangements, allowance should be made for the difficulties under which the system is carried on. It often turns out to be very difficult to determine how and when these injuries to the ribs are caused. The attendants naturally enough deny having used violence; the patient is often unable to say anything about it, or at any rate anything reliable; and the absence of external signs of injury, together with the fact that there has been no need to resort to force in the handling of the patient, renders the determination of the time of the injury (which may be only found on post-mortem examination) a very difficult problem. There are occasions, as in the forcible restraint of violent and impulsive epileptics, where considerable force is used on both sides, but it is very rare to find broken ribs under these circumstances; whilst, on the other hand, we may find a large amount of injury when it is very evident that the patient's power of violence or of resistance was very small. Does this mean that in the latter class the attendant lost his temper and wilfully assaulted the patient? This may occasionally happen, but it is difficult to

imagine that attendants, who know so well the consequences of being detected in any act of violence, would deliberately and for no reason commit one so easily found out.

It has been usual to say that the ribs of the insane are more brittle, and therefore more easily broken, than those of persons in health; and with some forms of insanity this may be true, but it is by no means a universal truth, and is more of a dictum than an ascertained fact. We shall see that only in rare instances does it appear to be true, and that even where such is apparently the case, there is great difficulty in saying why it is so.

With the view of determining the comparative strength of ribs in various forms of insanity, it occurred to me that some results might be obtained by ascertaining the breaking-weight of a rib fixed at one point, and arranged so as to carry weights at the other. We shall see that under the same conditions great differences are found to exist in the resistance to strain of this kind.

The conditions under which broken ribs may be supposed to occur are chiefly of two kinds; first, those where a patient is struck when standing up, and secondly, those where he is either sitting in a chair or lying on the ground. Allowance must of course be made for the amount of clothing the man is wearing at the time, and for the quantity of superincumbent fat, whilst other temporary conditions also come into play which modify greatly the effect of a blow, such as the state of tension of the muscles covering the ribs at the moment of impact, the angle at which the body meets the blow, and the particular stage of inspiration or expiration by which the greater or less degree of arching of the thorax is determined. In prize-fighting and professional boxing, fractures of the ribs are of rare occurrence, partly because the hits are delivered over the best protected parts, but chiefly because the most of the shock is distributed over the whole body, which is in a loose and mobile state. The rarity of a broken rib in prize-fighting, where heavy body-blows are given, to such an extent, indeed, that large swellings of the soft tissues are produced, is remarkable; and I am informed that it is only when a blow is delivered upon an adversary at the moment when he is turning sharply round, that such a casualty occurs. It is apparently true that even a heavy, strong man, well trained to hard hitting, is unable by the strongest blow he can give, and with all his weight thrown in, to break an opponent's rib by a direct blow, unless the same is delivered when the opponent is placed at a disadvantage, as above stated; and it is to all appearance right to say that fractures in the ribs of lunatics are not caused by hard, direct blows, but by a slighter

force which happens to take the patient when his body is placed at a disadvantage for resisting strain. Hence the absence of a bruise and the difficulty in finding out how these injuries occur. It is when the body is fixed that fractures are most apt to occur, or when—which amounts to the same thing—the person falls upon some solid object devoid of elasticity. It is not, then, the force of the blow, but the position of the body at the time that chiefly influences the question of the fracture of ribs. The injury is said to occur more in general paralytics than in any other class of the insane, because they are the most restless, are oftenest kept in bed, and are therefore most frequently in the position that is specially unfavourable for sustaining a blow with impunity. Knowing how restless and troublesome these general paralytics are, it is by no means improbable that at these times an attendant, leaning thoughtlessly over him (to feed or to clean him), may press the ribs with his knee, in which case a pressure of a few pounds would be sufficient to cause the injury. In such an instance the attendant would deny having used violence, but he may undoubtedly have caused the injury. It does not appear from experiments that the ribs of general paralytics break under a less weight than those of other classes of patients; so that if the statement as to their greater frequency of fracture in these persons is true, there must be some other reason than the one usually given—which is greater fragility and liability to snap on the slightest pressure.

The question of disease in the ribs of the insane has been investigated by Dr. Ormerod from the chemical and microscopical aspects, and more especially and recently by Dr. Wigglesworth. Ormerod found enlargement of the Haversian canals, and a granular appearance at times involving the whole Haversian system. In five cases quoted by Drs. Rogers and Brown, the ratio of organic constituents to earthy matter is much greater, while the ratio of lime to phosphoric acid is less in paralytics than in healthy adults. In Dr. Wigglesworth's thirty cases, eight were normal, seventeen showed slight (trivial) changes, chiefly vacuolation of the bone, and only three were quite abnormal, and in these the external layer of compact bone was thinned and riddled with cavities of all shapes and sizes, producing great porosity of the bone. This porosity is due, (1.) to the deposition of new bone being practically at a standstill; and (2.) to the absorption of bone being much in excess of the deposition of new bone. The conclusions he draws are that the ribs of lunatics are quite healthy in a minority of cases; that the majority show slight change, *i.e.*, thinning of the external layer of compact bone, and slight enlargement of the Haversian canals; but these

changes are generally trivial, and are correlated with the general failure of nutrition so common in insanity, or with plithisis or senile decay; that in a minority of cases (10 per cent.), clear and precise lesions are found produced by considerable internal absorption, which renders the bone very porous and brittle, and sets up the condition known as osteoporosis, probably having a causal condition with insanity.

The opinion of Dr. Yellowlees was that the condition occurred more in chronic insanity and in women; also that it affected more the anterior extremities of the higher ribs, and also the sternum.

In the experiments made here (which were carried out in a very careful way by Dr. Stansfield, the pathologist), we arranged to take the eighth rib from each side, and by attaching weights, to ascertain that at which the rib broke. It is not for a moment pretended that the results indicate the breaking-weights during life, nor have we had the means of ascertaining the results in persons dying not insane; but we do at any rate obtain results which give us the average weight that a rib in an insane person might be expected after death to sustain, and in a given case of fracture we have a fair scale with which to compare the bone under examination, and to judge whether it was above or below the standard of weight-carrying power.

Our plan was to fix the head of the rib in a vice, and to attach weights gradually by means of a hook fastened with wire round the free end. That the method is fairly accurate is proved by the general agreement between the breaking-weights of the corresponding ribs on the two sides of the body, though occasionally we found a considerable difference, due in some cases to the want of symmetry in the curve of the rib, in others to reasons, probably of a chemical nature, which we had not the opportunity to determine. The most common place for the fracture was a short distance in front of the angle, and this is also in accord with what occurs during life; but when the sternum is broken, the fracture of the ribs is generally near that bone. That the seat of fracture during life often corresponds with that of the blow, is shown by the occurrence of a bruise over the spot; but very often, even when many ribs have been fractured, there is no bruise, a frequent reason of injuries being detected only post-mortem, and not during life. Fracture of the ribs is not often a fatal injury; it is indeed astonishing to see what an amount of injury to the chest a patient may receive and yet recover. I once saw a woman whose chest I was afraid to touch, for the bones seemed to have been broken into small pieces, and there was scarcely a rib left sound on one side; yet she made a most excellent

recovery. In this case the injury had been caused by another patient. It is frequently impossible to say whether the fracture occurred before or after death, for in many patients the temperature falls considerably before death, and it is difficult to suppose that in such a person sufficient vital energy would be present to set up a process of repair. There can be little doubt, moreover, that the careless handling of dead bodies may cause fracture of the ribs, and this circumstance must be borne in mind in estimating the time as to when a fracture was done, in the absence of constitutional signs of repair. In the performance of artificial respiration, I have seen great pressure made on the chest-bones of insane persons whom it has been attempted to revive after choking from impaction of food, or after suicidal attempts by strangulation, but I never saw any fracture caused by the pressure, although I have witnessed considerable bruising of the soft tissues. The fact of the pressure being more or less gradually exerted probably accounts for this absence of breakage.

On examining the appended table, it appears that the average breaking-weight varies in the sexes, and even on opposite sides of the body. Among the males the average breaking-weight was $15\frac{11}{16}$ lbs. on the right side and $16\frac{1}{4}$ lbs. on the left side; among the women it was $10\frac{1}{8}$ lbs. on the right side and $9\frac{1}{2}$ lbs. on the left side. It thus appears that ribs taken fresh from the body and supported only at one end, break under a comparatively small weight, and yet it is surprising what force they bear during life when in their natural position and coverings. It is difficult to estimate correctly the *vis viva* of a good blow on the chest, but weight-striking machines are graduated up to 500 lbs., and though there is a good deal of knack in working them, we may reckon 300 lbs. as representing the force of a severe blow. In a healthy person such a blow would have no effect as regards causing fracture, if given in the ordinary way, though it is very certain that under special conditions a much less weight would do it.

We may conclude that, knowing the penalties, attendants are very careful not to give violent blows when patients are in such a position that the natural elasticity of the ribs can act, and that even if they did, such blows would not cause fracture. Also, that whether the person be sane or insane, a slight blow given when the body is in a certain position will cause fracture, and that when such does occur, it is more often than not done accidentally.

It does not of necessity follow that because a person is insane therefore the ribs are weakened; indeed, in some forms of

insanity—*e.g.*, epilepsy—the patients are very strong, and so it may be concluded are the bones; but the contention has been that especially in general paralysis there is a weakening or atrophy of the ribs that renders them specially liable to injury. In some of the cases quoted in the table it seems that the general paralytics sustained a breaking-weight far above the average.

The conclusions to be drawn may be summed up as follows:—

1. That a considerable difference is found to exist not only in the weight of the ribs on the two sides of the body, but also in the average breaking-weight.

2. That the lighter rib is often found to bear the heavier weight, and that there is no proportion between the weight of the rib and the number of pounds it is capable of sustaining; whence it would appear that physical conditions of structure have more to do with the strain-resisting power than has chemical change.

3. That persons suffering from disease of the heart or blood vessels bear less strain than others.

4. That persons suffering from advanced constitutional disease, such as phthisis, may have ribs that support a strain much above the average, and hence that there is no direct relation between constitutional strength and that of the ribs.

5. That when a blow causes a fracture, this is dependent not so much on the weight of the rib and its power of bearing strain as on other conditions.

6. That though we have not had the opportunity of comparing the breaking-weight of the ribs here with those of patients dying in general hospitals, yet from the fact that many of the cases here given have died from diseases identical with the latter, and that the insanity in our cases was often more of a functional than an organic character, and that these patients were often in strong bodily health up to the time of their last illness, it would seem that the dictum that the ribs of the insane are more brittle than those of the sane is true to a very limited extent only, and is almost confined to those affected with degeneration of the circulatory system.

TABLE SHOWING THE WEIGHT REQUIRED TO CAUSE FRACTURE OF THE RIB AND THE SEAT OF THE FRACTURE.

Name.	Age.	Cause of Death.	Mental Condition.	Number of Rib.	Weight of Rib.	Seat of Fracture.	Weight Applied.
1. Sarah P. . .	71	Pneumonia	{ Senile decay, very suicidal	{ 8th R.	...	Midway between head and angle	lbs. 8
				{ 8th L.	...	1½ in. in front of angle	oz. 2
2. William S. M.	42	"	Dementia	{ 8th R.	29.3 grammes	1 in. in front of angle	10 3
				{ 8th L.	27.2 "	{ Angle bent and supported 19 lbs.	13 6
						{ 6 oz. fixed at angle, then broke 1 inch in front	
3. William A. B.	29	General paralysis	General paralysis	{ 8th R.	24.6 "	Bent immediately in front of angle	9 2
				{ 8th L.	25 "	Between head and angle	9 2
						{ Fixed at angle, then broke ½ in. in front	13 0
							12 0
4. Margaret O'C.	43	{ Pericarditis and pneumonia	Delusional mania	{ 8th R.	15 grs. 550 mg.	2 in. in front of angle	7 0
				{ 7th L.	19 " 200 "	3 in. from sternal end	0 0
5. John H. T. .	37	Pneumonia	Demented	{ 8th R.	25 " 700 "	Between head and angle	8 8
				{ 8th L.	28 " 200 "	1 in. in front of angle	8 12
6. Robert R. . .	39	Apoplexy	{ Epileptic and demented	{ 8th R.	17 " 50 "	¼ in. behind the angle	14 12
				{ 8th L.	16 " 750 "	½ in. in front	14 12
7. Rebecca P. .	56	Brown atrophy of heart	Demented	{ 8th R.	8 " 900 "	½ in. in front of angle	14 12
				{ 8th L.	9 " 200 "	At angle and also 2 in. in front	14 8
						{ Bent at angle with 15 lbs., 1½ in. in front with same weight	7 4
8. Sarah C. . .	29	Phthisis	Mania	{ 8th R.	17 " 300 "	Midway between head and angle	7 12
				{ 8th L.	16 " 700 "	Bent 2 in. in front of angle	15 0
9. Ann S. . . .	45	"	{ Epileptic and demented	{ 8th R.	12 grammes	2 in. in front of angle	15 0
				{ 8th L.	10 "	Bent at angle	9 3
10. John J. W. .	68	Diarrhoea	Senile dementia	{ 8th R.	27 grs. 800 m.g.	At angle	7 12
				{ 8th L.	25 "		9 4
							8 12

Name.	Age.	Cause of Death.	Mental Condition.	Number of Rib.	Weight of Rib.	Seat of Fracture.	Weight Applied.
11. Susan G. . .	69	Fatty heart	Delusional mania	{ 8th R. 8th L.	17 grs. 200 m.g. 16 " 200 "	1 in. in front of angle Bent between head and angle	lbs. oz. 7 4 6 8
12. Fanny G. . .	60	Mitral disease	Dementia (suicidal)	{ 8th R. 8th L.	12 " 700 " 13 " 500 "	{ 1 in. in front of angle, and also 3/4 in. ant. to that 3/4 in. in front of angle, and also 1 1/2 in. ant. to that	4 0 7 4
13. Susannah H. .	69	{ Pleurisy and mitral } incompetence	Demented	{ 8th R. 8th L.	15 " 100 " 18 " 500 "	Too soft, could not be tested Bent at angle At angle	3 12 17 6 15 4
14. Alfred W. T. .	40	Phthisis	Delusional insanity	{ 8th R. 8th L.	18 " 500 " 30 "	Bent 3/4 in. behind angle At angle and 3 in. in front of angle	14 12
15. James S. . .	73	{ Failure of heart, due } to Bright's disease	Mania	{ 8th R. 8th L.	31 " 11 " 500 "	1/2 in. behind angle and 2 in. from ant. end 1 in. behind angle	15 4 11 8 9 8
16. Ellen L. . .	36	Gangrene of lung	Demented	{ 8th R. 8th L.	11 " 700 " 11.7 grammes	1/2 in. behind angle and at seat of old fracture, 2 in. from sternal end At angle	11 4 8 12 10 4
17. Mary K. . .	57	{ Mitral disease and } fatty heart	Imbecile	{ 8th R. 8th L.	10.2 " 11.2 "	1 in. in front of angle 1 in. in front of angle	8 8 9 0 7 8
18. Ellen P. . .	79	Rupture of right ventricle	Senile decay	{ 8th R. 8th L.	11 " 18.4 "	1 in. in front of angle 3/4 in. in front of angle	7 8 4 4 13 12
19. William P. .	49	Chronic brain disease	Imbecile	{ 8th R. 8th L.	21 " 31.2 "	3/4 in. in front of angle 3/4 in. in front of angle	14 12 14 4 21 4
20. Andrew W. .	74	{ Hemorrhage into pan- } creas and collapse	Senile decay	{ 8th R. 8th L.	33.5 " 33.5 "	3/4 in. in front of angle 3/4 in. in front of angle	19 4 22 8

21. Mary Ann C.	60	{ Pneumonia and mitral incompetence	Dementia (chronic brain disease)	{ 8th R. 8th L.	14.2 grammes	"	{ At angle 2 in. in front of angle 1 in. behind angle 1 1/2 in. in front of angle }	12 12 10 4 7 4 6 8 20 12 23 0 ...
22. Richard C.	17	Phthisis	{ Epilepsy and dementia	{ 8th R. 8th L. 8th R. 8th L.	23.8 26 18	"	{ Bent half-way between 1/4 in. in front of angle Did not break at 23 lbs. 1/4 in. in front of angle }	9 12
23. George T.	61	{ Pneumonia and cerebral hæmorrhage	Paralytic dementia	{ 8th L.	17.5	"	{ 2 places, 3/4 in. in front of angle, and 2 in. in front of this	7 12
24. Mary J. H.	45	Acute miliary tubercle	{ Tubercular melancholia	{ 8th R. 8th L.	16 15	"	{ 1 in. behind angle 1/4 in. behind angle }	13 4 10 8
25. Caroline F.	27	Phthisis and pleurisy	"	{ 8th R. 8th L.	8 8.75	"	{ 1 in. in front of angle 1 in. in front of angle }	6 8
26. Sarah A.	70	{ Endocarditis and pneumonia	Epilepsy and dementia	{ 8th R. 8th L.	13 11	"	{ 1 in. in front of angle 1 1/4 in. in front of angle }	10 0 11 0
27. Benjamin J.	57	Chronic brain-wasting	"	{ 8th R. 8th L.	19.8 17.8	"	{ 1/2 in. behind 1/4 in. in front of angle 1/4 in. in front of angle }	7 0 13 4 12 0 13 8
28. Richard M.	52	Phthisis	Mania	{ 8th R. 8th L.	19.5 23	"	{ Neither of these broke at 23 lbs.	...
29. Samuel A.	32	"	Epilepsy	{ 8th R. 8th L.	17 18	"	{ 1 in. in front of angle Did not break at 29 lbs.	23 0
30. Mary Ann T.	35	Fatty heart	General paralysis	{ 8th R. 8th L.	18.5 13.5	"	{ 1/2 in. behind angle 1/4 in. in front of angle }	21 0 17 0
31. Elizabeth P.	53	{ Aortic incompetence and mitral stenosis	Mania	{ 8th R. 8th L.	12 12.75	"	{ 1 1/4 in. in front of angle 1/4 in. in front of angle }	6 0 9 8
32. Rosina B.	70	{ Intestinal ulceration Aortic incompetence and fatty heart	Senile decay	{ 8th R. 8th L.	8.8 7.8	"	{ 1 in. behind angle Beut at angle at 8 1/2 lbs. 1/2 in. behind angle }	6 0 13 0
33. Albert W.	46	General paralysis	General paralysis	8th R.	19	"	{ 1 in. in front of angle 1/4 in. behind angle }	13 8 14 0
34. Richard H.	76	...	Dementia	{ 8th R. 8th L.	15.2 15.8	"	{ 1 in. in front of angle 1/4 in. behind angle 1/4 in. in front of angle }	11 0 14 0 11 0

Name.	Age.	Cause of Death.	Mental Condition.	Number of Rib.	Weight of Rib.	Seat of Fracture.	Weight Applied.
35. Elizabeth G. .	56	Phthisis	{ Epileptic and de- mented	{ 8th R. 8th L.	16 grammes	1 in. in front of angle { $\frac{1}{2}$ in. behind angle. $\frac{1}{2}$ in. in front of angle $\frac{1}{4}$ in. in front of angle $\frac{1}{2}$ in. in front of angle $\frac{1}{4}$ in. in front of angle (2 places) $1\frac{1}{2}$ in. in front of angle and $1\frac{1}{2}$ in. ant. to that At angle	lbs. oz. 16 0 14 0 14 8 16 0 13 8 15 0 14 0 27 0
36. W. Loftus S. .	35	General paralysis	General paralysis	{ 8th R. 8th L.	17 "		8 0
37. Annie M. . .	40	Phthisis	Epilepsy	{ 8th R. 8th L.	16.2 " 16.3 "		11 8
38. Stephen W. .	36	{ General paralysis and phthisis	General paralysis	{ 8th R. 8th L.	20 " 18.3 "	Did not break at $33\frac{1}{2}$ lbs.	17 0
39. Margaret C. .	80	Brain-wasting	Dementia	{ 8th R. 8th L.	13.5 " 13.3 "	$1\frac{1}{2}$ in. in front 1 in. in front	17 0
40. Daniel M. . .	32	{ Phthisis and paralytic dementia	Paralytic dementia	{ 8th R. 8th L.	34.3 " 33.3 "	$1\frac{1}{2}$ in. in front $1\frac{1}{2}$ in. in front	15 0
41. James C. . .	44	{ General paralysis and phthisis	General paralysis	{ 8th R. 8th L.	22.9 " 24.5 "	$1\frac{1}{4}$ in. in front $\frac{1}{2}$ in. in front	31 0

AVERAGE BREAKING-WEIGHT.

Males.		Females.	
Right.	Left.	Right.	Left.
$15\frac{1}{2}$ lbs.	$16\frac{1}{4}$ lbs.	$10\frac{1}{4}$ lbs.	$9\frac{1}{2}$ lbs.